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(56) Documents Cited
US 5488472 A US 5026998 A US 4319406 A
US [illegible] A

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(54) Abstract Title
Pulley alignment gauge

(57) A pulley alignment gauge for aligning pulleys in a drive system, such as a front end accessory drive system on an automotive engine, includes pulley mounts 24a,24b and a laser 22 connected to a frame 20. The drive belt is removed before the gauge is placed on the pulleys. The pulley mounts 24a,24b position the gauge on one of the pulleys 14,16 in the pair to be aligned. The laser 22 emits a light beam onto the adjacent pulley 16 to determine pulley alignment. The laser 22 targets the centre rib of the adjacent pulley being aligned and the rib spacing is used to gauge the degree of misalignment.

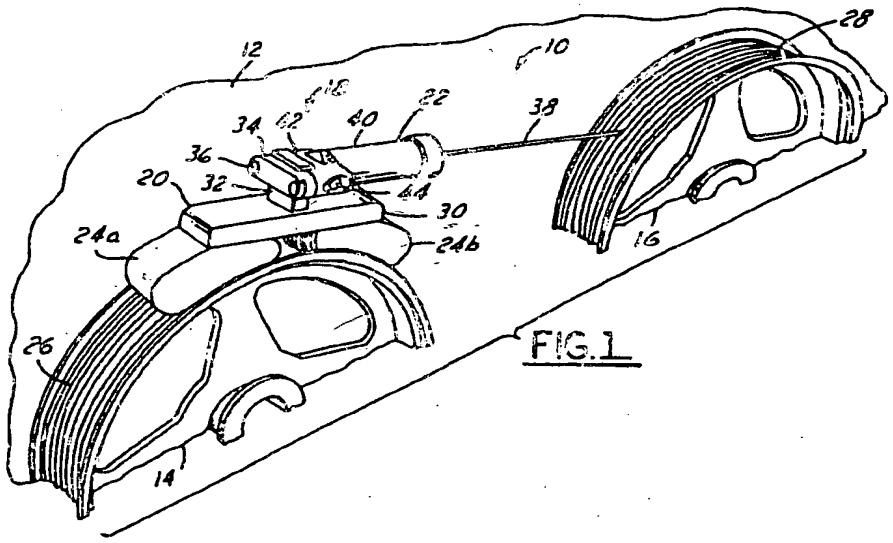

FIG.1

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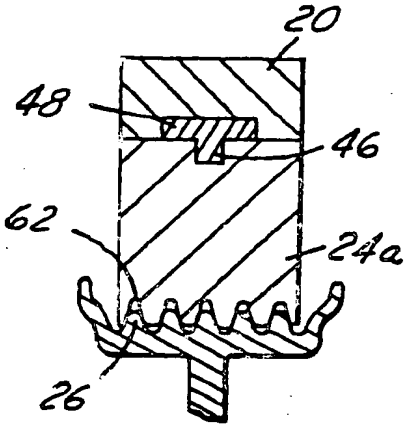

FIG.3

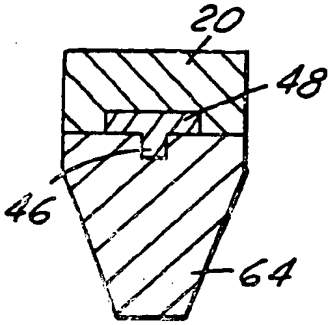

FIG.4

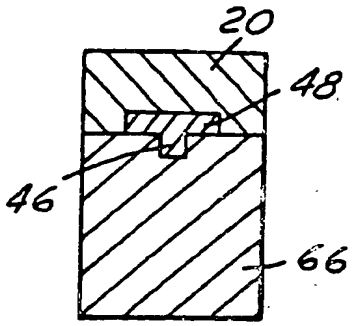

FIG.5

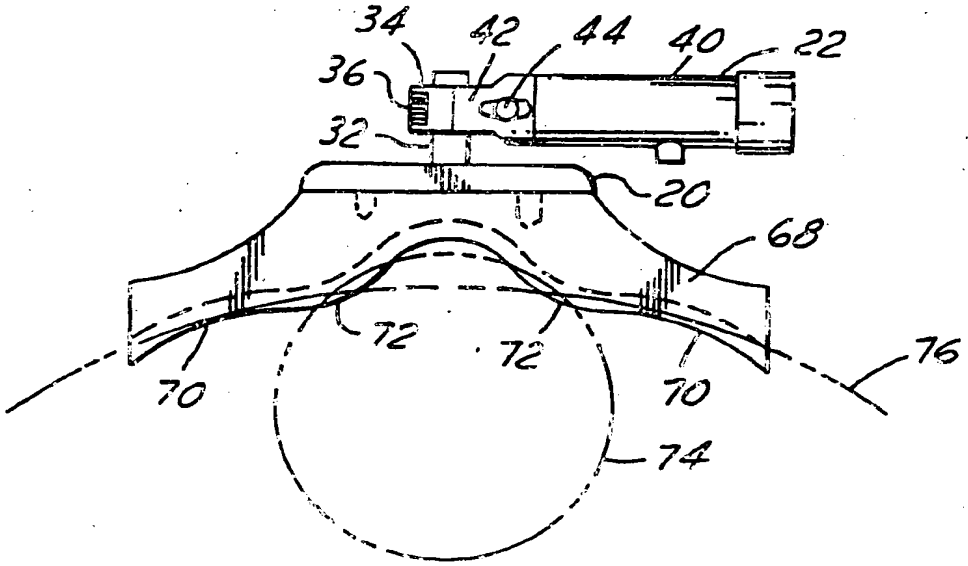

FIG.6

this method of alignment is impractical for service due to the extensive time and cost spent tearing down the vehicle and collecting the data.

The present invention provides a quick and accurate process for aligning pulleys in a front end accessory drive belt system.

In one particular aspect of the invention, the gauge includes a frame, a pulley mount attached to the frame and adapted to position the gauge on a first pulley of the drive system, and a laser mounted on the frame. The laser emits a light beam onto a second pulley of the drive system so as to enable alignment of the first pulley relative to the second pulley.

In a preferred embodiment, the pulley mounts can be interchanged to accommodate various pulley types and sizes. The pulley mounts can be attached magnetically to the frame for ease of changing.

An advantage of the invention is that alignment of any length span within the drive system may be accomplished.

Another advantage of the present invention is a highly accurate pulley alignment may be achieved, depending on specific design tolerance and span length.

Also another advantage of the present invention is that an accurate diagnostic may be completed in a relatively short time.

Yet another advantage of the present invention is customer satisfaction will be improved by eliminating misdiagnosis and changing otherwise acceptable parts.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a pair of pulleys to be aligned with the use of a pulley alignment gauge according to the present invention;

Figure 2 is a front view of a pulley alignment gauge shown in Figure 1 according to the present invention;

As shown in the example of Figures 2 and 3, two pulley mounts, 24a and 24b are used and are mounted to the bottom of frame 20. Those skilled in the art will recognize in view of this disclosure that pulley mounts 24a and 24b may be attached to frame 20 by any attachment means available such as screws. In a preferred embodiment, pulley mounts 24a and 24b may be attached by magnets 48 to frame 20, as shown in Figure 2. To properly attach pulley mounts 24 to frame 20, magnets 48 have tabs 46 for aligning pulley mounts 24a and 24b to the center of frame 20. Each pulley mount 24a and 24b has flat top 50 for mounting to bottom 52 of frame 20, convex bottom surface 54 for mating with pulley 14 or pulley 16, and outer side 56 of a sufficient radius to prevent interference when mounted on pulley 14 or pulley 16. Convex bottom surface 54 enables pulley mounts 24a and 24b to adapt to a plurality of pulley diameters including a relatively small pulley 58 and relatively large pulley 60. Alternatively, a plurality of pulley mount sizes may be used to accommodate a variety of pulley diameters. Pulley mounts 24a and 24b have a plurality of complementing grooves 62 for mounting to ribs 26 of a pulley. To use gauge 18, the number of grooves 62 (see Figure 3) from where light beam 38 hits to the target center of ribs 28 are counted to determine the misalignment. The misalignment angle is the arc tangent of the [(# of grooves * rib spacing)/span length]. Reversing the direction of the measurement from pulley 14 to pulley 16 and turning pulleys 14 and 16 will further reveal errors in alignment such as pulley tilt, run-out, or bent shafts.

In an alternative embodiment of this invention, as shown in Figure 4, each pulley mount 64 has sides that taper toward the center and meet to make a flat bottom. Pulley mounts 64 are modeled to engage a type of pulley used for v-belts. Alternatively, as shown in Figure 5, pulley mounts 66 have a flat surface across the bottom without grooves to mate with a flat pulley. With the use of magnets 48, pulley mounts 24a, 64, 66 are interchangeable to fit various pulley sizes or types.

CLAIMS

1. A pulley alignment gauge for aligning pulleys mounted in a drive system, with said gauge comprising:

a frame (20);

a pulley mount (24a,24b) attached to said frame (20) adapted to position the gauge on a first pulley (14) of the drive system; and

a laser (22) mounted on said frame (20), with said laser adapted to emit a light beam onto a second pulley (16) of the drive system so as enable alignment of the first pulley relative to the second pulley.

2. An alignment gauge as claimed in claim 1, wherein said pulley mount is removably attached to said frame.

3. An alignment gauge as claimed in claim 1, wherein said emitted light beam strikes a center of the second pulley.

4. An alignment gauge as claimed in claim 2, wherein said pulley mount is magnetically removably attached to said frame.

5. An alignment gauge as claimed in claim 2, further comprising a plurality of pulley mounts each removably attachable to said frame, with said plurality of pulley mounts being adapted to accommodate a plurality of pulley diameters, respectively.

6. An alignment gauge as claimed in claim 2, further comprising a plurality of pulley mounts each removably attachable to said frame, with said plurality of pulley mounts being adapted to accommodate a plurality of pulley types, respectively.

14. A kit as claimed in claim 13, wherein said pulley mount has a concave surface conjoined with said convex surface, with said concave surface being adapted to engage a plurality of relatively large pulley diameters.

15. A pulley alignment gauge for aligning pulleys in a front end accessory drive system of an automotive engine, with said gauge comprising:

a frame;

a pulley mount removably attached to said frame, with said mount adapted to engage a first pulley of the front end accessory drive system, with said mount having a convex surface adapted to engage a plurality of pulley diameters; and

a laser mounted on said frame, with said laser adapted to emit a light beam onto a center of a second pulley of the front end accessory drive system so as enable alignment of the first pulley relative to the second pulley.

16. An alignment gauge as claimed in claim 15, wherein said pulley mount is magnetically removably attached to said frame.

17. An alignment gauge as claimed in claim 15, further comprising a plurality of pulley mounts each removably attachable to said frame, with said plurality of pulley mounts being adapted to accommodate a plurality of pulley diameters, respectively.

18. An alignment gauge as claimed in claim 15, further comprising a plurality of pulley mounts each removably attachable to said frame, with said plurality of pulley mounts being adapted to accommodate a plurality of pulley types, respectively.

The Patent Office

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INVESTOR IN PEOPLE

Application No: GB 9819199.2 **Examiner:** Michael Walker
Claims searched: ALL **Date of search:** 30 December 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G1M (MEBA, MEBB, MEBG, MEBX)

Int Cl (Ed.6): G01B 5/24, 5/25; 11/27, 11/275

Other: ON-LINE : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	US 5488472	(JANUARY) see abstract	1,9
Y	US 5026998	(HÖLZL) see abstract	1,9
Y	US 4319406	(PEHRSON) see abstract	1,9
Y	US 4231161	(BELFIORE) see abstract	1,9

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Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.